

# Advantages and Difficulties of Learning Science Online during the COVID-19 Pandemic Lockdown in Lebanon, a Quantitative Study

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## ABSTRACT:

This research aims at determining students' satisfaction regarding learning science during corona virus (COVID-19) lockdown through the available devices such as desktop computers, laptops, tablets, smartphones, the available platforms for instance Microsoft teams, zoom, Canvas, Eskool, Moodle, Google classroom, Edmodo and the available applications like Facebook and WhatsApp. Also, it reveals their abilities to discuss the science lessons content with their teachers online, their learning environment at home, their abilities to understand science online, their anxiety about COVID-19, if any, their opinion about learning online one day per week after the pandemic is over, their perceptions regarding the advantages and the difficulties of learning science online at a distance, and their suggestions regarding enhancing this learning experience. Moreover, this research aims at examining the statistically significant association, if any, between students' perceptions regarding going back to school and their anxiety about COVID-19. As for the instruments, the researchers have used a validated and modified online survey carried out by a full-time university professor and a teacher holder of a PhD degree, both experts in this field of studies. After modifying and validating it, the online survey was filled out by 1341 students in the elementary, intermediate, and secondary levels who live in different Lebanese regions such as Mount Lebanon, North of Lebanon, Akkar, South of Lebanon, Nabatiyeh, Bekaa and Baalbak-Hirmel. The quantitative results of this research were determined through the descriptive statistics, frequencies and percentage, and the inferential statistics, the Pearson's Chi-Squares test. Results of the study quantitative approach have revealed that 60.2% of the 1341 respondents were unsatisfied when it came down to learning science during the coronavirus lockdown, 66.2% were against learning science online a day per week, 33.1% had a bad learning environment at home, 48.7% did not discuss adequately their science lessons content with their teachers, 79.4% did not adequately understand science online at a distance, 80.8% refused going back to school before their parents take the vaccine and 91.5% were worried about Coronavirus (COVID-19). In addition, the inferential statistics through its Pearson's Chi-Squares test have revealed a statistically significant association between the total factors of students' perceptions regarding going back to school and their anxiety about coronavirus (COVID-19). The findings of the qualitative approach of this research have revealed that many of the respondents believed that learning science is a joke and for fun only. On the other hand, some believed that it helps keeping them on track while studying



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science, it gives them more time to ask questions and allows them to surf the internet and look up for answers on their own, which in turn allows them to rely on their own selves more than they usually do, and that it is much more comfortable than face-to-face learning. Some also believed that teaching online allows the teachers to diversify their teaching methods by integrating tutorial videos, presentations, and by recording their sessions. The qualitative findings have also unveiled that in addition to requiring great internet connection and adequate software and devices capable of providing sounds and streaming videos (technical issues with effective impact), learning online requires skilled and well-trained teachers to make it successful and requires too much concentration and focus from the teachers and their students. Finally, through the research qualitative findings, students have proposed less talking and content size reduction and more practicing in learning science through e-lab activities and feasible and safe experiments they can carry out at home. The researchers have recommended the science teachers to rely more on simulations, virtual or feasible and safe experiments during hard times online, to facilitate the given content and reduce its size, and to develop their skills in teaching online. The researchers have also recommended the schools principals to be very careful when they decide that students should start attending school. Finally, the Lebanese government was recommended to provide students with good internet connection, generate efficient electricity at all times, and provide students in need with adequate devices capable of making the online learning experiment more successful.

**KEYWORDS:** Learning science online, science teachers, the coronavirus COVID-19, coronavirus anxiety, Microsoft teams, zoom, Canvas, Eskool, Moodle, Google classroom, Edmodo, Facebook, WhatsApp.

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## INTRODUCTION

In 2020, more than 177 countries had to shut their school doors worldwide due to Covid-19 outbreak. The UNESCO, the United Nations Educational, Scientific and Cultural Organization, reported that 1.3 billion students enrolled at schools and universities, almost 72.4%, were banned from attending their daily in-person classes. This crisis has fundamentally changed the teaching and learning methods in the whole world as in-person classes were taken out of the equation. Therefore, academic institutions have resorted to all handy online platforms to proceed with their learning journey remotely during those hard times. In turn, many countries put efforts into ensuring that all e-learning tools are safe and continuously accessible to all students (Al iimyan, 2020).

Consequently, many schools adopted the broadcast-and-internet-based online learning policies. Luckily, this contributed to reaching 69% of students enrolled in the elementary, intermediate, and secondary levels worldwide. Unluckily, low and middle-income countries as well as poor households had limited access to these technological platforms. For that, 31% of the school students couldn't benefit from the broadcast or the internet services because they lack technological resources at home due to their misfortunate financial situation (Unicef, 2020).

In the Gulf region, remote teaching has been adopted by many schools and universities although they were used to applying traditional teaching methods ever since they have been established. Governments took immediate action to address that critical situation and provided their academic institutions with online platforms and devices, as well as with television broadcast channels. For instance, the Saudi Arabia Government created more than 20 televised channels of educational content and a YouTube channel to facilitate the remote learning process as far as possible. Furthermore, the Emirates government organized, in turn, a free workshop on "How to Become an Online Teacher in 24 Hours" that aimed at training more than 42,000 teachers (Al iimyan, 2020).

Locally, during the scholastic year 2019-2020, as the first Covid-19 case was reported in Lebanon at the end of February 2020, Lebanese schools closed by March 2020. Consequently, about 1.2 million students were affected in Lebanon, in all types of schools. For that, the ministry of Education and Higher Education (MEHE) introduced the distance learning in three tracks: television, online and paper-based learning (Abu Moghli & Shuayb, 2020).

At the onset of the health crisis, schools resorted to social media platforms and networking sites as an alternative to traditional classroom sessions. Afterwards, better services tailored to address this issue were introduced, such as, Zoom and Microsoft Teams. In order to make students' access to Online Learning Resources easier, the lessons were recorded and uploaded so that students could download and access them at any time and live classes were offered on a regular basis as often as possible (Kadi, 2020).

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On April 30, 2020, MEHE launched an online platform under a Digital Learning initiative, TV sessions of educational content and a digital library. This platform also allowed the teachers and the students to share resources and assignments and to have live online classes. However, teachers have voiced their concerns about connecting to the internet and the obstacles they were facing due to constant power cuts. On the other hand, low-income families were unable to offer their children the necessary technological devices such as smartphones, tablets, computers which eventually rendered remote learning unequal (Abu Moghli & Shuayb, 2020).

Consequently, teachers opted for a different method which involved posting PowerPoint presentations and other files on the WhatsApp groups, created for this purpose, and then interacted with their students via the same groups at a specific time (Kadi, 2020). They found this method to be the most convenient, accessible and reliable for teaching online. On the other hand, some schools held virtual classes from 8:00 am to 3:00 pm through specific platforms and asked students to attend them as if they were in real traditional classes. The teachers sit in front of their computers and provide students with supportive materials such as videos, notes and exercises to enhance the learning process (Kadi, 2020).

In 2020-2021, schools were kept closed due to the second wave of Covid -19 that swept the country and they did not open their doors for most of the year (The Lebanese Ministry of Public Health, 2021)..

Now when it comes to learning sciences, there are several ways to teach science: the traditional teaching method based on the transmissive mode through-which knowledge is passively transmitted from teachers to students, and the experimental method through-which students have the opportunity to pose a problem, formulate hypotheses and perform an experiment in order to validate them (El Rouadi, 2021).

Fortunately, the e-labs are now available and allow students to conduct experiments, use virtual materials and obtain virtual results as well. Note that some teachers ask their students to follow specific instructions without providing students with opportunities to pose a scientific problem or formulate their own hypothesis. Consequently, they don't develop their scientific experimental skills as when they put them in authentic experimental situations (El Rouadi, 2021).

Science teachers should be extremely qualified professionals, acquainted with technology, with a deep understanding of the subject matter and a thorough pedagogical understanding. Moreover, they should develop leadership skills. Instead of commanding pupils autocratically, as factory bosses did in the past, they should lead groups of students to stimulate collaborative and real learning (Sawyer, 2004).

Here, we have to ask ourselves that despite all of the aforementioned steps taken to make the online learning successful in Lebanon, was it that successful when it came to learning science remotely? Were students satisfied while learning science at a distance? Were they able to adequately understand it? Did they have platforms and devices with good internet connection? Are there any further steps that should be taken to avoid the difficulties in learning online and ameliorate it even more to suit all masses?

## II. THEORETICAL FRAMEWORK

Connectivism is a modern age learning theory developed by George Siemens and Stephen Downes in 2004 and published for the masses in 2005 (University of Southampton, 2021).



Figure 1: Connectivism (University of Southampton, 2021)



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Years later, Connectivism remains considered by many as an extension of the social Constructivism learning theory because it relies on humans, technology, actions and social relations to create and distribute knowledge continuously. Technology combined with humans' social interaction and cognitive collaboration form a network that connects people with each other and through this network knowledge emerges and humans are taught in a range of informal or formal situations (University of Southampton, 2021).

For the Connectivism learning theory, learning does not rely on specific people, places and times. For it, learning is an unlimited action that takes place across a distributed network in what is known as "Networked Learning" through which teachers guide, manage, advise, build and activate the ongoing learning process in an effective and proper way (University of Southampton, 2021).

Connectivism is called a modern age learning theory because it requires digital skills and equal literacies; and for that reason, teachers are required to be skilled in digitally managing the online session for it to be effective. More importantly, it is called as such because it depends on the given opportunity to teach and learn online, and takes advantage in growing and developing the skills of both teachers and students(University of Southampton, 2021).

### III. LIMITATIONS OF THE STUDY

This study had to deal with one limitation only. Many students were out of reach because they were living at a far distance in Lebanon. Therefore, the researchers went out of their way and relied on an online survey to reach the 1341 students who constituted the sample of the study.

### IV. DELIMITATIONS OF THE STUDY

The online survey reached students in Beirut, Mount Lebanon, North of Lebanon, Akkar, South of Lebanon, Nabatiyeh, Bekaa, and Baalbak-Hirmel, excluding the Syrian and Palestinian refugees. The cooperation among the students in filling out the online survey and sending its link to their classmates and friends played a significant role in the accuracy of the results and findings of this quantitative study.

### V- LITERATURE REVIEW

Throughout the years, online teaching has become so popular and countries all over the world have recently entered the e-learning industry, which gives the learners, mainly those living afar or failing to attend classes for some reason, an unprecedented opportunity to access these online learning materials, at any time, from the comfort of their home (The Dexway Team, 2020).

Moreover, today, many learners are counting on those online courses since they can access them from home or from any other place at their convenience. They can simply log in to virtual classrooms and embark on an exceptional journey (The Dexway Team, 2020).

Today, many learners prefer online teaching rather than in-person learning (face-to-face learning). These learners are determined to broaden their knowledge, to master new skills and acquire new information. Therefore, they are interested in taking courses that enable them to do so (The Dexway Team, 2020).

Just like any other issue, some people strongly supported the online learning approach while others refuted it. Those who were in favor of such approach said that online teaching is much better than the traditional one because it offers the learners a wide range of electronic resources (The Dexway Team, 2020).

In traditional teaching, instructors find it really challenging to keep their students focused mainly during long lectures or learning sessions. However, online learning is more beneficial due to the various E-resources it offers and that are capable of drawing students' attention for longer hours. Moreover, instructors can evaluate their students more often. They can monitor their progress and assist them when need be (The Dexway Team, 2020).



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However, many believe that online learning has lots of negative impact on learners. In face-to-face learning, instructors interact with the learners, help them solve their problems and encourage them, the thing that renders the learning process way easier, richer and more meaningful (Tamm, Fakhri, Martisiute, & Lee, 2019).

Unluckily, offering students the aforesaid benefits does not apply to online teaching. More studies shall be conducted at this level which definitely requires time and effort to prove its effectiveness (Tamm, Fakhri, Martisiute, & Lee, 2019).

Furthermore, many people think that online education causes students to be socially marginalized and prevents them from communicating with each other. This may cause them to suffer from lack of human communication in the future and they may experience stress, anxiety and negative thoughts that require the interference of specialists (Tamm, Fakhri, Martisiute, & Lee, 2019).

Many people think as well that learning through the distance learning approach is not made to fit everyone as it requires a lot of time management skills and commitment for it to be successful. At school, students are supervised and supported by their teachers who interact with them based on a pre-planned schedule, work with them in groups, help them to improve their communication skills and motivate them whenever they feel discouraged (Tamm, Fakhri, Martisiute, & Lee, 2019).

When studying online, students shall assume their responsibilities on their own to remain on course without anyone pushing them to do so. Their ability to manage their time may be negatively affected and they may miss the mark when it comes to meeting deadlines (Tamm, Fakhri, Martisiute, & Lee, 2019).

Moreover, the most popular weakness in the online learning approach nowadays is cheating through various means. Teachers are not able to oversee their students' academic behavior anymore and detecting cheating has become tougher because the teacher must keep an eye on each student at a time during the exam. Unluckily, this may result in getting fraudulent exam results due to poor assessment (Tamm, Fakhri, Martisiute, & Lee, 2019).

Another disadvantage of online learning is the tendency to focus on theory rather than on practice. In fact, setting up practical projects online is not as easy as in the classroom and requires more than just a simple presentation of a theory (Tamm, Fakhri, Martisiute, & Lee, 2019).

Furthermore, the online teaching approach encounters one major obstacle since it is incompatible with materials taught in class. According to many, this learning method can be more propitious for humanities and social science studies rather than scientific materials such as engineering and medical science that entail practicing. Although things may change in the future, we insist that online learning cannot rise to the level at which it is as beneficial as an autopsy session for medical students or a real-life industrial training for engineering students (Tamm, Fakhri, Martisiute, & Lee, 2019).

Therefore, schools must meet certain standards so that they can perform online teaching in the same efficient way as the traditional teaching method. In addition to that, they should present few criteria, assign official platforms and provide convenient training for teachers and instructors to strengthen their online teaching skills (Tamm, Fakhri, Martisiute, & Lee, 2019).

In the context of classroom and online teaching and the approaches related thereto alongside the favorable and unfavorable debates regarding them, a type of Coronavirus (SARS-CoV-2 virus) emerged from a popular Huanan seafood market in Wuhan, China in December 2019. This virus causes the COVID-19 infectious disease. Many tried to identify and debate its origin (Cennimo, et al., 2020), and decided to close schools and universities for the sake of everyone's safety in order to limit the proliferation of the virus (UNESCO, 2020).

Coronavirus exists in different forms but this latest discovered type of Coronavirus causes the COVID-19 disease, which is viewed as a pandemic since it spreads easily from one person to another. This infectious virus is associated with the following typical symptoms: cough, sore throat, headache or nausea, loss of taste or smell, fever, chills or muscle pain, shortness of breath and breathing difficulties, vomiting and prolonged fatigue. In addition to that, it might cause in some cases irreversible disorders in the respiratory system leading to death (Sauer, 2020).



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Due to this challenging situation, schools had to close worldwide and the number of pre-primary, primary, middle school, and secondary level students affected by the national school closures all over the world increased from 0.3 billion to 1.38 billion between February and March 2020 (Li & Lalani, 2020).

Therefore, the teaching methods had to be drastically adapted to this new reality. As a result, learning online has developed significantly as many have adopted it to ensure that students and teachers can continue to perform their activities virtually (Li & Lalani, 2020).

With this adaptation and change in teaching methods, some people have raised questions about the potential adoption of online learning in the post-pandemic period and the impact it will have on the educational systems across the globe (Li & Lalani, 2020).

Regardless of these questions, world investments in learning online have soared to \$19.66 billion in 2019 before Covid 19 crisis, and they may reach \$350 billion by 2025. Despite the fact that this virus has turned the world upside down in the most negative way possible, there has been an important rise in the use of e-learning platforms around the world during the outbreak (Li & Lalani, 2020).

Some academic institutions are still relying upon E-platforms with free access services, whereas others are building new partnerships with many software corporations aiming at offering their students the best platforms that can enable them to learn online in a more effective way. Many, on one hand, reckon that this rushed and unprepared shift to online teaching will turn out to be an awful experience for both teachers and students who are not trained and qualified for such an advanced learning method. Others, on the other hand, just as Wang Tao, the Vice President of Tencent Education, firmly believe that a new fruitful educational system will come to light shortly (Li & Lalani, 2020).

As a result of this global virus outbreak, online teaching has expanded, and technology has become an indispensable part of education after proving its effectiveness ever since. This is due to the fact that university instructors and school teachers succeeded in connecting with their students in many different regions by texting them, chatting with them in groups and through video calls. Hence, many people perceive that both, in-person and online classes, will turn out to be collectively profitable for learners and instructors equally (Li & Lalani, 2020).

Regardless of the positive impact of online teaching and the worldwide support, the world might face many obstacles that need to be defeated. Students who don't have stable internet services won't be able to attend their online classes. By the same token, the fact that many students around the globe do not have a desktop computer or a laptop to date has brought matters to a head, and this remains an unsolved problem to be addressed in many countries. Consequently, learning online will put a burden upon learners who are not provided with adequate technological support rather than enabling them to acquire proper knowledge and education (Li & Lalani, 2020).

Even if some people who got used to the traditional way of teaching regard the above problems as the least of their worries, it has been proven that students memorize between 25% and 60% of the information taught online versus only 8 to 10% of those taught in the classroom (Li & Lalani, 2020).

This is because learners can go over the online lessons, listen to them, read them and studies them whenever and however they want at their convenience. According to several studies, students are likely to become more effective learners when learning is fun and when all their senses are working together. This can be reached through the various electronic platforms features that are able to motivate and engage students more in the learning process sparking in them the love of learning (Li & Lalani, 2020).

It goes without saying that the Covid-19 crisis has hindered and modified many educational systems. In his book entitled "*21 Lessons for the 21st Century*" Harari (2018) affirmed that schools keep concentrating on basic educational capabilities instead of the analytical thinking and adjustability skills essential for learners' future career. That begs the question, is shifting to online teaching what we need to create a new and more practical teaching method for our students? While some are still hesitating about getting ahead, others have started planning to make online teaching a crucial part of their educational system (Harari, 2018).



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This global pandemic has taught us that we are all in dire need of broadening knowledge all over the world, no matter the circumstances. Accordingly, if the online learning can serve that purpose, we must all understand its potential (Li & Lalani, 2020).

## VI. RESEARCH QUESTIONS

The research questions presented below were constructed according to the literature review presented above and they were answered by 1341 respondents in the online survey.

1. During the lockdown of the second Coronavirus (COVID-19) wave, were students satisfied in learning science online through distance learning?
2. After experimenting the online learning in Lebanon, what is the percentage of students who agreed on learning science online through the distance learning approach for one day per week during the regular school year?
3. During the lockdown of the second Coronavirus (COVID-19) wave, how was students' learning environment at home?
4. At a distance, were students capable of discussing the science lessons content with their teachers online? If not, then for what reasons?
5. Through the distance learning approach, were students able to understand science lessons online?
6. Do students agree on coming back to school before their parents are vaccinated?
7. What is the percentage of students who are anxious about Coronavirus (COVID-19)?
8. Is there a statistically significant association between students' perceptions regarding going back to school and their anxiety about Coronavirus (COVID-19), if any?
9. What are students' perceptions regarding the advantages of learning science through the distance learning approach?
10. What are students' perceptions regarding the difficulties in learning science through distance learning approach?
11. What are students' suggestions regarding enhancing learning science through the distance learning approach?

## VII. METHODOLOGY

**Design of the Research:** This study is classified quantitative; thus its descriptive design does not begin with hypotheses as they are developed after the data collection and analysis (CIRT, 2015).

Through its quantitative approach, this study aimed at showing:

- Students' gender, living regions type of school and different school levels;
- Students' satisfaction regarding learning science;
- Students' opinions regarding learning online a day per week;
- Students' learning environment at home;
- Students' discussions with their science teachers online, if any;
- Students' abilities to understand science online;
- Students' approval regarding coming back to school before their parents are vaccinated;
- Students' anxiety about COVID-19;
- Students' perceptions regarding the advantages of learning science through the distance learning approach
- Students' perceptions regarding the difficulties in learning science through the distance learning approach.
- Students' suggestions regarding enhancing learning science through the distance learning approach.



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Additionally, when the population of the study is too large, the simple random sampling technique is the one usually implemented (Bhat, Adi;, 2019).

Therefore, the researchers adopted the simple random sampling technique to select students in the elementary, intermediate and secondary levels for their study.

**Research Instruments:** For their study, the researchers developed an online survey of 14 items. The first 11 items were questions with one answer each and the last 3 items were questions with no predetermined answers as follows:

- The first item related to students' gender;
- The second item was about their living region;
- The third item was about the type of the school;
- The fourth item was about the school level;
- The fifth item was about students' satisfaction regarding learning science;
- The six item was about students' opinions regarding learning online a day per week;
- The seventh item was about students' learning environment at home;
- The eighth item was about students' discussions with their science teachers online, if any
- The ninth item was about students' abilities to understand science online;
- The tenth item was about students' acceptance regarding coming back to school before their parents are vaccinated;
- The eleventh item was about students' anxiety regarding COVID-19.
- The twelfth item was about students' perceptions regarding the advantages of learning science through the distance learning approach.
- The thirtieth item was about students' perceptions regarding the difficulties in learning science online at a distance.
- The fortieth item was about students' suggestions regarding enhancing learning science online at a distance.

1. You are :	a. A male student
	b. A female student
2. You live in:	a. Beirut
	b. Mount Lebanon
	c. North of Lebanon
	d. Akkar
	e. South of Lebanon
	f. Nabatiyeh
	g. Bekaa
	h. Baalbak-Hirmel
3. You study in a:	a. Lebanese public school
	b. Lebanese private school
4. You are in the:	a. Elementary level
	b. Intermediate level
	c. Secondary level
5. Were you satisfied learning Science online?	a. Completely satisfied
	b. Kind of satisfied



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	<b>c.</b> Kind of unsatisfied
	<b>d.</b> Completely unsatisfied
	<b>e.</b> I do not use the internet connection
<b>6.</b> Do you agree to learn science online for one Day per week after the pandemic is over?	<b>a.</b> Yes
	<b>b.</b> No
<b>7.</b> The learning environment at home was:	<b>a.</b> Bad
	<b>b.</b> Average
	<b>c.</b> Good
	<b>d.</b> Very good
	<b>e.</b> Excellent
<b>8.</b> Were there any discussions between the students and the science teacher online?	<b>a.</b> Most of the time
	<b>b.</b> Rarely
	<b>c.</b> No, we do not discuss because the teacher explains all the time
	<b>d.</b> No, we do not interact because we lacked of the videoconference service
<b>9.</b> Were you able to understand science online?	<b>a.</b> No
	<b>b.</b> Partially
	<b>c.</b> Totally
<b>10.</b> Do you agree on going back to school before your parents take the vaccine?	<b>a.</b> Yes
	<b>b.</b> No
<b>11.</b> Are you anxious about COVID-19?	<b>a.</b> No, not at all
	<b>b.</b> Yes, a little bit
	<b>c.</b> Yes, too much
<b>12.</b> What are your perceptions regarding the advantages of learning science through the distance learning approach?	Answer:



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<b>13.</b> What are your perceptions regarding the difficulties in learning science online through the distance learning approach?	Answer:
<b>14.</b> What are your suggestions regarding enhancing learning science through the distance learning approach?	Answer:

Regarding items 12, 13 and 14, students answered in their own words when it came down to their perceptions about the advantageous and difficulties in learning science through the distance learning approach, and their suggestions to ameliorate it.

**Survey's Validity:** The survey of the study was validated by a university professor and a teacher in the secondary level holder of a PhD degree, both experts in this field of study.

**Data Collection Procedure:**

The researchers created their online survey and sent it to students in different school levels, who in turn sent it to their classmates and friends in different regions across Lebanon. Thus, the researchers were able to collect their data from 1341 students who live in Beirut, Mount Lebanon, North of Lebanon, Akkar, South of Lebanon, Nabatiyeh, Bekaa and Baalbak-Hirmel. At the end of the aforementioned procedure, the researchers organized the answers for analysis.

**VIII. DATA ANALYSIS**

**Quantitative Results**

The data was collected from the online survey in an Excel Spread Sheet. Later on, the researchers imported that data into the Statistical Package for the Social Science (SPSS) and analyzed it.

**Table 1: Descriptive Statistics according to the Gender of the Respondents (Frequency and Percentage)**

Gender of the Respondents		
	Frequency	Percentage
Male	565	42.13%
Female	776	57.87%
<b>Total</b>	<b>1341</b>	<b>100%</b>

The above table represents the gender of the respondents and clearly shows that there was no bias in the selection of the students, the respondents of online survey. The male students had 565 counts (42.13%) while the female students had 776 counts (57.87%) for a total of 1341 respondents (100%).

**Table 2: Descriptive Statistics according to Students' Distribution in Different Regions (Frequency and Percentage)**

Students' Region		
	Frequency	Percentage
Beirut	240	17.9%
Mount Lebanon	451	33.6%
North of Lebanon	103	7.7%
Akkar	251	18.7%
South of Lebanon	93	6.9%
Nabatiyeh	45	3.4%
Bekaa	155	11.6%
Baalbak-Hirmel	3	0.2%
<b>Total</b>	<b>1341</b>	<b>100%</b>

The above table represents the distribution of respondents in the different Lebanese regions. It clearly shows that students were randomly selected from different regions.

The table shows that despite living far in Baalbak-Hirmel, 3 students managed to fill it out.

More importantly, the survey was filled out by 240 students in Beirut (17.9%), 451 students in Mount Lebanon (33.6%), 103 students in the North of Lebanon (7.7%), 251 students in Akkar (18.7%), 93 students in the South of Lebanon (6.9%), 45 students in Nabatiyeh (3.4%), 155 students in Bekaa (11.6%), and 3 students in Baalbak-Hirmel (0.2%).

**Table 3: Descriptive Statistics concerning Students' Level at School (Frequency and Percentage)**

Students' Level at School		
	Frequency	Percentage
Elementary level	169	12.6%
Intermediate level	390	29.1%
Secondary level	781	58.3%
<b>Total</b>	<b>1341</b>	<b>100%</b>

The above table represents students' levels at school and it shows that 169 respondents (12.6%) were students in the elementary level, 390 (29.1%) were in the intermediate level, while 781 (58.3%) were in the secondary level. These numbers and percentages show that students of the secondary cycle responded more than those in the elementary and intermediate levels.

**Table 4: Descriptive Statistics on Students' Satisfaction Regarding Learning Science (Frequency and Percentage)**

Students' Satisfaction Regarding Learning Science		
	Frequency	Percentage
Completely satisfied	83	6.2%
Kind of satisfied	429	32.0%
Kind of unsatisfied	331	24.7%

Completely unsatisfied	477	35.5%
I do not use the internet connection	21	1.6%
<b>Total</b>	<b>1341</b>	<b>100%</b>

The above table represents students' satisfaction regarding learning science through the distance learning approach and it shows that 83 students (6.2%) were satisfied, 429 (32.0%) were quite satisfied, 331 (24.7%) were quite unsatisfied, 475 (35.5%) were completely unsatisfied, while 21 (1.6%) had no internet connection.

Thus, more students were unsatisfied ( $331 + 475 = 806$ ) regarding learning science than those who were satisfied ( $83 + 429 = 512$ ). As a result, more than half of the respondents ( $24.7\% + 35.5\% = 60.2\%$ ) were unsatisfied when it came down to learning science during the second wave of Coronavirus (COVID-19).

**Table 5: Descriptive Statistics on Students' Opinions Regarding Learning Science Online a Day per Week (Frequency and Percentage)**

<b>Students' Opinions Regarding Learning Science Online a Day per Week</b>		
	Frequency	Percentage
Yes	454	33.8%
No	887	66.2%
<b>Total</b>	<b>1341</b>	<b>100%</b>

The above table represents students' opinion on learning science online a day per week and it shows that 454 respondents (33.8%) were in favor of learning science online, while 887 (66.2%) were against it. However, the number of respondents who were against learning science online one day per week was almost twice that of the respondents who were in favor of it.

**Table 6: Descriptive Statistics on Students' Learning Environment at Home (Frequency and Percentage)**

<b>Students' Learning Environment at Home</b>		
	Frequency	Percentage
Bad	444	33.1%
Average	470	35.1%
Good	202	15.0%
Very good	119	8.9%
Excellent	106	7.9%
<b>Total</b>	<b>1341</b>	<b>100%</b>

The above table represents students' learning environment at home during Coronavirus (COVID-19) lockdown. This table shows that 444 respondents (33.1%) had a bad learning environment at home, 470 (35.1%) had an average one, 202 (15.0%) had a good one, 119 (8.9%) had a very good one, while 106 (7.9%) had an excellent learning environment at home.

Accordingly, more than one third of the respondents had a bad learning environment at home during Coronavirus (COVID-19) lockdown, which in turn might indicate that many students in Lebanon cannot benefit from learning online through the distance learning approach due to their bad learning environment at home.

**Table 7: Descriptive Statistics on Student's Discussions with their Science Teachers Online(Frequency and Percentage)**

<b>Student's Discussions with their Science Teachers Online</b>		
	Frequency	Percentage
Most of the times	689	51.3%
Rarely	334	24.9%
No, we do not discuss because the teacher explains all the time	96	7.2%
No, we do not interact because of the lack of the videoconference service	222	16.6%
<b>Total</b>	<b>1341</b>	<b>100%</b>

The above table represents students' discussions with their science teachers online. It shows that 689 respondents (51.3%) had the opportunity to discuss their science lessons content with their teachers online through the distance learning approach during Coronavirus (COVID-19) lockdown. However, 334 (24.9%) rarely discussed anything, 96 (7.2%) did not interact with their teachers who were using the traditional transmissive approach all the time, while 222 (16.6%) did not interact with their teachers because of the lack of videoconference service. Overall,  $334 + 96 + 222 = 652$  ( $24.9\% + 7.2\% + 16.6\% = 48.7\%$ ), a little bit less than half of the respondents, did not discuss adequately their science lessons content with their teachers during Coronavirus (COVID-19) lockdown.

**Table 8: Descriptive Statistics on Student's Abilities in Understanding Science Online(Frequency and Percentage)**

<b>Students' Abilities in Understanding Science Online</b>		
	Frequency	Percentage
No	258	19.3%
Partially understood	806	60.1%
Totally understood	277	20.6%
<b>Total</b>	<b>1341</b>	<b>100%</b>

The above table represents students' abilities in understanding science online through the distance learning approach during Coronavirus (COVID-19) lockdown. The table shows that 258 respondents (19.3%) did not understand science online through the distance learning approach, 806 (60.1%) partially understood it, while 277 (20.6%) completely understood it. On the other hand,  $258 + 806 = 1064$  ( $19.3\% + 60.1\% = 79.4\%$ ) students in the elementary, intermediate and secondary levels did not adequately understand science through the distance learning approach during Coronavirus (COVID-19) lockdown.

**Table 9: Descriptive Statistics on Students' Opinions Regarding Coming Back to School before their Parents Are Vaccinated (Frequency and Percentage)**

<b>Students' Opinions Regarding Coming Back to School before their Parents Are Vaccinated</b>		
	Frequency	Percentage
Yes	269	19.3%
No	1082	80.8%
<b>Total</b>	<b>1341</b>	<b>100%</b>

The above table represents students' opinions regarding coming back to school before their parents are vaccinated. It shows that 269 respondents (19.3%) accepted the idea while 1082 (80.8%) refused it and it highlights the need to determine the rate of students' anxiety about Coronavirus (COVID-19) as shown in table 10.

**Table 10: Descriptive Statistics on Students' Anxiety Regarding COVID-19(Frequency and Percentage)**

Students' Anxiety Regarding Coronavirus(COVID-19)		
	Frequency	Percentage
It does not bother me at all	116	8.6%
Yes, a little bit	617	46.0%
Yes, too much	608	45.5%
<b>Total</b>	<b>1341</b>	<b>100%</b>

The above table represents students' anxiety regarding Coronavirus (COVID-19). It shows that 116 respondents (8.6%) were not worried about Coronavirus (COVID-19), 617 (46.0%) were a little bit worried, while 608 (45.5%) were too much worried about it. Accordingly, this shows that 617 + 608 = 1225 (91.5%) were worried about Coronavirus (COVID-19).

**Table 11: Pearson's Chi-Square Test Results on Students' Perceptions Regarding Going Back to School and their Anxiety about Coronavirus (COVID-19), if any**

Pearson Chi-Square Alfa Values for the Total Factors of Students' Perceptions Regarding Going Back to School and their Anxiety towards the Coronavirus COVID-19, if any	
Students' Anxiety towards Coronavirus (COVID-19), if any, Total Factors	
Students' Perceptions Regarding Going Back to School Total Factors	1.0899×10 <sup>-20</sup>

The above table displays the results of the Pearson Chi-Square test. As seem, at a significant Alfa value less than 0.05, there was a statistically significant association between the total factors of students' perceptions regarding going back to school and their anxiety about Coronavirus (COVID-19).

**Qualitative Findings**

Regarding students' perceptions about the advantages of learning science online through the distance learning approach and its difficulties, and their suggestions for enhancing learning science through the distance learning approach, the most relevant findings were summarized in the table below:

Students' perceptions regarding the advantages of learning science through the distance learning approach.	<ol style="list-style-type: none"> <li>1. There aren't any;</li> <li>2. The online learning is about playing not learning;</li> <li>3. The online learning just helps keeping us on track in studying science;</li> <li>4. The online learning is much more comfortable than learnir face-to-face learning;</li> <li>5. The online learning allows us to look up for answers online;</li> <li>6. The online learning allows us to rely on ourselves even more;</li> <li>7. The online learning diversifies the ways of teaching by providing us with videos, presentations, etc.;</li> <li>8. The online learning gives us time to ask more questions;</li> <li>9. The online learning allows us to watch the recorded session later on as many times as we want and need.</li> </ol>
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Students' perceptions regarding the difficulties in 1. The online learning requires too much concentration and



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learning science through the distance learning approach.

- focus from the teachers and their students;
2. Learning online forbids us from staying focused the whole time because we are forced to look at a screen all the time;
3. The online learning requires too much time management from the teachers and the students;
4. The online learning requires great internet connection;
5. The online learning requires no electrical outages;
6. The online learning requires adequate software and devices capable of providing sounds and streaming videos;
7. The online learning requires too much effort from the teachers and their students;
8. The online learning requires skilled and well-trained teachers to make it successful;
9. There are no experiments or lab activities during learning science online;

Students' suggestions regarding enhancing learning science through the distance learning approach

1. The teacher has to write and prepare everything so that students can understand science better during distance learning;
2. The given load of information should be simplified and its content size should also be reduced;
3. More practicing and less talking is recommended;
4. Having adequate equipment with good internet connection is strongly needed in distance learning.
5. Using videos recorded by the science teachers for some experiments helps students to get more engaged in online learning;
6. Engaging students in research or feasible and safe experiments is recommended.
7. More interaction between the teachers and their students is recommended.

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## IX. CONCLUSION AND HYPOTHESES

Results of the study showed that there was no bias between male and female students, their school type, levels in school and regions of living.

Regarding students' satisfaction when it came down to learning science during the second wave of Coronavirus (COVID-19), more than half of the respondents were unsatisfied.

Regarding students' learning online a day per week, almost two third of the respondents disapproved the proposition and were against it.

Regarding students' learning environment at home during Coronavirus (COVID-19) lockdown, almost one third of the respondents had a bad learning environment at home.

Regarding students discussing the science lessons content with their teachers online during Coronavirus (COVID-19) lockdown, almost half of the respondents did not discuss them in a proper way.

Regarding students' abilities in understanding science through the distance learning approach during Coronavirus (COVID-19) lockdown, more than two third of the respondents, 79.4% precisely, did not adequately understand science online.



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Regarding students' opinions or readiness about coming back to school before their parents are vaccinated, the majority of the respondents, 80.8% precisely, refused it.

Regarding students' anxiety about Coronavirus (COVID-19), the majority of the respondents, 91.5% precisely, were concerned and worried about it.

Regarding students' perceptions about the advantages of learning science online through the distance learning approach, some of the respondents believed that there were not any and some others thought that it was a joke for playing and not learning. On the other hand, some thought that online learning through the distance learning approach just helps keeping them on track when it comes to studying science and that it is much more comfortable than face-to-face learning.

Positively, some of the respondents believed that online learning gives students more time to ask questions and allows them to surf the internet and look up for answers on their own, which in turn enables them to rely on themselves more than they usually do and to become more autonomous.

Additionally, online learning gives the teachers the opportunity to diversify their teaching methods and provide them with videos, presentations. Moreover, recorded sessions allow students to watch them later as much as they want and need.

Regarding students' perceptions about the difficulties in learning science online through the distance learning approach, it was revealed that the online learning forbids practicing during the sessions and that it requires too much effort and time management from the teachers and their students, great internet connection, and adequate software and devices capable of providing sounds and videos. Most importantly, it was also unveiled that it requires skilled and well-trained teachers to make it successful and that it demands too much concentration and focus from the teachers and their students. However, being forced to look at the screen the whole time hinders their focus.

Finally, regarding students' suggestions for enhancing learning science through the distance learning approach, some suggested that teachers should interact even more with their students, engage students in interactive activities and talk less, and that they must write and prepare everything in order to allow the students to learn at ease at a distance. On the other hand, some proposed that students should have adequate devices and a good internet connection allowing them to attend the online sessions properly and download the uploaded sessions. Moreover, some suggested that the content has to be reduced in size, explained very well in order to make it clear to all students. Finally, students suggested doing some practical work at home, such as conducting some feasible and safe experiments at home.

Based on the aforementioned, the researchers have hypothesized that many students were not satisfied learning science online during Coronavirus (COVID-19) lockdown as they weren't able to discuss their science lessons adequately with their teachers and couldn't understand the given content as they should, though these results could not be generalized due to the need of other samples.

Additionally, the researchers have hypothesized that even though many students were not satisfied about learning science online, they weren't ready to go back to school before their parents taking are vaccinated as they were concerned and worried about Coronavirus (COVID-19), though these results also could not be generalized due to the need of other samples.

## X- RECOMMENDATIONS

### For the science teachers

- Science teachers are hereby recommended to reduce the content in size and make it as easy, as smooth and as clear as possible for their students who are learning online through the distance learning approach especially during hard times such as the lockdown caused by Coronavirus (COVID-19).
- Science teachers are also recommended to develop their skills in teaching online. They are recommended to rely on E-labs when teaching online since more practice and less talk seems to be more suitable for their students. They can also encourage students to perform feasible and safe experiments that they can apply at home. This can make



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learning science online fun for students, which is a critical point that should be addressed and not be left aside as students' learning ameliorates when they are engaged in the activity and enjoying it (Growthengineering, 2020).

## For the schools principals

- Table 11 revealed a statistically significant association between students' perceptions regarding going back to school and their anxiety about Coronavirus (COVID-19). Thus, schools principals should pay more attention to this point and take their anxiety into consideration when they decide that students should start attending school.

## For the Lebanese government

- Having no good internet connection, dealing with electrical outages (technical issues with significant impact) and the lack of good software and devices were the most significant reasons that made learning science online through the distance learning approach during Coronavirus (COVID-19) lockdown a failed story for many students.

The Lebanese government is hereby recommended to provide good internet connection services and to generate sufficient electricity at all times. It is also recommended to provide those who are in need with adequate devices capable of making the online learning experiment successful to every student.

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